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Supplementary Materials III

The test

1. The potential of hydrogen (pH) is defined as:

   a) $pH = c(H_3O^+)$

   b) $pH = -\log c(H_3O^+)/\text{mol} \cdot \text{dm}^{-3}$

   c) $\log pH = c(H_3O^+)$

   d) $c(H_3O^+) \cdot c(OH^-) = K_w$

   e) $c(H_3O^+) = K_w / c(OH^-)$

   (Remembering; 2 points)

2. The indicators:

   a) are strong inorganic acids.

   b) are colourless liquids.

   c) have same color in acidic and basic solutions.

   d) change their color according to the relative concentration of H_3O^+ and OH^- ions.

   e) are strong inorganic bases.

   (Remembering; 2 points)

3. The precise measurement of pH could be done by:

   a) litmus paper

   b) phenolphthalein

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c) pH-meter

e) ionometer

d) methyl orange

(Remembering; 2 points)

4. Which of the equations listed below describes the process of neutralization:

a) $Fe + S = FeS$

b) $H_3O^+(aq) + OH^-(aq) = 2H_2O(l)$

c) $2NaCl + H_2SO_4 = Na_2SO_4 + 2HCl$

d) $Cu^{2+}(aq) + 2OH^-(aq) = Cu(OH)_2(s)$

e) $As_2S_3 + 6H_2O = 2H_3AsO_3 + 3H_2S\uparrow$

(Understanding; 4 points)

5. In which of these solutions, $c(H_3O^+)$ has the highest value?

a) Blood, pH $= 7.42$

b) Lemonade, pH $= 2.91$

c) Shampoo, pH $= 9.21$

d) Tea, pH $= 3.94$

e) Tomato puree, pH $= 4.32$

(Understanding; 4 points)

6. If the temperature of pure water is 55 $^\circ$C, the pH value of pure water will be:

a) 7

b) below 7.

c) above 7.

d) below 10^{-7} mol/L.

e) above 10^{-7} mol/L.

(Understanding 4 points)

7. The solution of phenolphthalein is colourless, but in pH = 8-10 it turns to violet. In which of these solutions phenolphthalein will turn to violet?

a) slightly to medium acidic

b) neutral

c) strongly acidic

d) slightly basic

e) very strongly basic

(Understanding; 4 points)

8. If the pH value of a solution changes from 6 to 3, how the concentration of H_3O^+ ions changes?

a) The concentration of H_3O^+ ions will increase by three times.

b) The concentration of H_3O^+ ions will decrease by three times.

c) The concentration of H_3O^+ ions will be the same. Just the pH is changed.

d) The concentration of H_3O^+ ions will increase by thousand times.

e) The concentration of H_3O^+ ions will decrease by thousand times.

(Understanding; 4 points)

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9. In a solution of acetic acid, a solution of sodium hydroxide is added. What kind of process occurs and how the pH value changes?

   a) Acetic acid donates protons and the pH decreases.

   b) Acetic acid donates protons and the pH increases.

   c) Acetic acid accepts protons and the pH increases.

   d) Acetic acid accepts protons and the pH decreases.

   e) The pH value does not change at all.

   (Understanding; 4 points)

10. The pH of a solution of an acid is 3. What would you do to change pH = 3 to pH = 5?

    a) Evaporate the water until pH = 5.

    b) Add some amount of the same acid.

    c) Add water until pH = 5

    d) Add some amount of weak acid.

    e) Change the indicator.

    (Applying; 5 points)

11. Calculate pH of solutions where:

a) $c(H_3O^+) = 1 \cdot 10^{-4}$ mol/dm^3 and   b) $c(OH^-) = 10^{-8}$ mol/dm^3

[Applying, 5 points in total: a) 2 and b) 3 points]

12. Calculate the concentration of H_3O^+ ions in a solution if pH is 6?
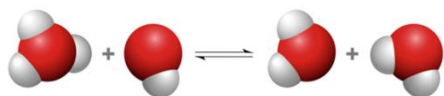
 (Applying, 5 points)
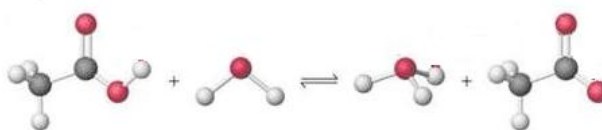
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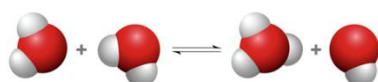
13. On the line bellow each picture write down the type of the process and the corresponding
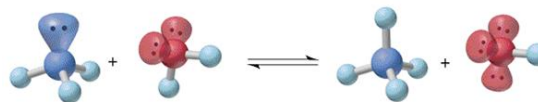
pH value or pH range.

a)_____   b)_____

c)_____   d)_____

(Analysing, 6 points in total)

14. A scientist is given 6 solutions labeled A to F. The scientist tests each solution with

universal indicator and records the results as follows:

Solution	A	B	C	D	E	F
Colour of universal indicator	Yellow	Blue	Green	Red	Purple	Orange

Arrange the solutions in order from most acidic (at the left) to most basic (at the right) in the

table below, the colour and the approximate pH range of each solution in the table.

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Solution						
Colour of universal indicator						
pH range						

(Analysing, 6 points)

15. The table below shows three natural indicators and the colours they will have at different

pH values.

Indicator	Colour in acid (pH < 7)	Colour at pH = 7	Colour in base (pH > 7)
Red cabbage water	red, pink	purple	blue, green, yellow
Red onion water	red	violet	green
Turmeric water	yellow	yellow	red

Decide which indicator is the best to show you that you have completely neutralized a

solution of HCl with solution of NaOH.

(Evaluating; 8 points)